UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/646,532	08/22/2003	Kenneth S. Collins	6915 P03	8483

7590 06/15/2006

Patent Counsel, M/S 2061
Legal Affairs Dept.
Applied Materials, Inc.
P.O. Box 450-A
Santa Clara, CA 95035

EXAMINER	
ARANCIBIA, MAUREEN GRAMAGLIA	
ART UNIT	**PAPER NUMBER**
1763	

DATE MAILED: 06/15/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/646,532	COLLINS ET AL.	
	Examiner	Art Unit	
	Maureen G. Arancibia	1763	

-- The MAILING DATE of this communication appears on the cover sh t with th correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *27 March 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-11,13-33 and 40-63* is/are pending in the application.

4a) Of the above claim(s) *11,13-25,27 and 40-58* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-10,26,28-33 and 59-63* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *02/06*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Terminal Disclaimer

1. The terminal disclaimers filed on 27 March 2006 disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration date of pending U.S. Application Serial Number 10/646,526 or pending U.S. Application Serial Number 10/646,612 have been reviewed and are accepted. The terminal disclaimers have been recorded.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. **Claims 29-33 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.**

Specifically, it is unclear what Applicant intends to claim by reciting "an RF bias **power** generator" in Claim 29 versus "an RF bias **voltage** generator" in Claim 30. It is unclear whether these two terms should be interpreted differently, and if so, where support for such interpretation may be located in the Specification. Clarification and/or correction is requested.

Claims 31-33 are rejected due to their dependence on Claim 29.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 1-10, 12, 26, 28-33, and 59-63 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent Application Publication 2003/0029567 to Dhindsa et al. in view of U.S. Patent 5,958,140 to Arami et al. (from Applicant's IDS).

In regards to Claims 1-10, 12, 26, 28-33, and 59-63, Dhindsa et al. teaches a capacitively coupled plasma apparatus (Figure 1), comprising an enclosure 12 comprising a side wall 14 and a ceiling 16 defining a chamber; a workpiece support pedestal 28 coupled to an RF return potential via conductive plate 26 (Paragraph 24), said workpiece support pedestal facing an interior surface of the ceiling so as to define therebetween a process region 38 extending generally across the diameter of said workpiece support pedestal; an RF plasma source generator 54 coupled to the ceiling 22 for capacitively coupling RF source power into said chamber; a gas distribution apparatus (gas distribution plate or showerhead) and a supply of process gas (Paragraph 25); and an RF bias generator 60 having an RF bias frequency of about 2 MHz coupled to the workpiece support pedestal via electrode 34. (Paragraphs 24 and 25)

Further in regards to Claims 9 and 28, Dhindsa et al. teaches that the enclosure comprises a base 18, and that the gas distribution apparatus comprises a plurality of devices and diffusers (*baffles and openings*; Paragraph 25) on the interior surface of the ceiling, as broadly recited in the claims.

Dhindsa et al. does not expressly teach that the gas distribution apparatus comprises the structural features recited in Claims 1, 59, 62, and 63.

Arami et al. teaches a gas distribution apparatus for a semiconductor processing chamber 21, comprising: generally concentric inner 37A and outer 37B gas injection radial zones in the ceiling of chamber 21 (Figure 2), said inner zone comprising at least one gas injection orifice 48 and said outer zone comprising plural gas injection orifices 48 arranged in a generally annular array that is generally concentric with the gas injection orifices of the inner gas injection zone (Figure 5); plural separate gas supplies 41, 42, 43 of respective different process gases; and a gas distribution controller comprising a first set of valves 44A, 44A, 44A (*mass-flow controllers*) coupling the separate gas supplies to said at least one orifice of said inner gas injection zone and a second set of valves 44B, 44B, 44B (*mass-flow controllers*) coupling the separate gas supplies to said plural orifices of said outer gas injection zone (Column 4, Lines 44-55). The first set of valves 44A, 44A, 44A and the second set of valves 44B, 44B, 44B are coupled directly between each of the separate gas supplies and the orifices of the inner and outer gas injection zones, respectively. (Figure 2)

It would have been obvious to one of ordinary skill in the art to modify the apparatus taught by Dhindsa et al. to use the gas distribution apparatus taught by Arami et al. The motivation for doing so, as taught by Arami et al. (Column 10, Lines 29-44), would have been to use a gas distribution apparatus that allows for the individually-controllable supply of various process gases to defined concentric regions of the processing chamber, thereby permitting the fine-tuning of the process uniformity.

Further in regards to Claim 59, the combination of Dhindsa et al. and Arami et al. does not expressly teach that the inner gas injection zone has exactly one gas injection orifice.

Arami et al. teaches that the number of gas injection orifices per unit area is a result-effective variable that affects the flow rate from that area, and in turn the process uniformity. (Column 7, Lines 7-16; Column 9, Lines 4-7)

Therefore, in view of the teachings of Arami et al., it would have been obvious to one of ordinary skill in the art, through routine experimentation, with a reasonable expectation of success, to optimize the number of gas injection orifices per unit area as a result-effect variable, so as to specifically have exactly one gas injection orifice in the inner gas injection zone, in order to in turn optimize the flow rate and process uniformity.

Further in regards to Claims 1-10, 12, 26, 28-33, and 59-63, it has been held that a claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. *Ex parte Masham*, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987)

In this case, the plasma reactor taught by the combination of Dhindsa et al. and Arami et al. includes all of the structural limitations of Claims 1-10, 12, 26, 28-33, and 59-63, and would be capable of performing plasma immersion ion implantation, based on the process settings. The gas distribution apparatus taught by Dhindsa et al. would be inherently capable of introducing process gas containing a species to be ion implanted into a layer of the workpiece. The RF bias with a frequency of about 2 MHz

coupled to the workpiece support pedestal taught by Dhindsa et al. would inherently meet the limitations of Claims 2-4 and 29-33, including that the RF bias power generator can control a sheath voltage across a plasma sheath overlying the workpiece support pedestal, depending on the other process settings of the plasma reactor. Moreover, the frequency of about 2 MHz meets the limitations recited in Claims 5-8. The bias voltage can correspond to an implantation depth to which a species is to be implanted into a layer, again based on the other process settings if the apparatus taught by Dhindsa et al. were used for the recited intended use of plasma immersion ion implantation.

This rejection is based on the fact the apparatus structure taught above has the inherent capability of being used in the manner intended by the Applicant. When a rejection is based on inherency, a rejection under 35 U.S.C. 102 or U.S.C. 103 is appropriate. (See *In re Fitzgerald* 205 USPQ 594 or MPEP 2112).

Also note that the inclusion of material or article worked upon by a structure being claimed does not impart patentability to the claims. *In re Young*, 75 F.2d 966, 25 USPQ 69 (CCPA 1935) (as restated in *In re Otto*, 312 F.2d 937, 136 USPQ 458, 459 (CCPA 1963)).

Finally, further in regards to Claims 59-63, the particular type of gases used are process limitations rather than structural limitations, and the recitation of a particular type of gas does not limit an apparatus claim, see *In re Casey,* 152 USPQ 235; *In re Rishoi,* 94 USPQ 71; *In re Young,* 25 USPQ 69; *In re Dulberg,* 129 USPQ 348; *Ex parte Thibault,* 64 USPQ 666; and *Ex parte Masham,* 2 USPQ2d 1647. This rejection is based on the fact the apparatus structure taught by the combination of Dhindsa et al. and

Arami et al. has the inherent capability of being used in the manner intended by the Applicant. When a rejection is based on the inherency, a rejection under 35 U.S.C. 102 or U.S.C. 103 is appropriate. (See *In re Fitzgerald* 205 USPQ 594 or MPEP 2112).

Response to Arguments

6. Applicant's arguments with respect to the pending claims have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. U.S. Patent 6,887,341 to Strang et al. (Figure 1) and Japanese Patent Application Publication 62-290885A to Hasegawa (Figure) teach related gas distribution apparatuses.

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Maureen G. Arancibia whose telephone number is (571) 272-1219. The examiner can normally be reached on core hours of 10-5, Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on (571) 272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Maureen G. Arancibia
Patent Examiner
Art Unit 1763

Parviz Hassanzadeh
Supervisory Patent Examiner
Art Unit 1763